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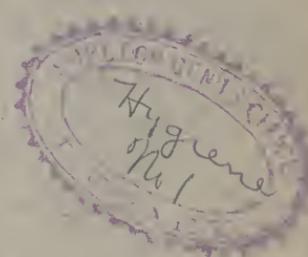
# HYGIENE OF SUBURBAN LIFE.

A LECTURE

Delivered at Clifton Hall, suburb of Cincinnati, Friday Evening,  
March 29th, 1879.

BY

PROF. ROBERTS BARTHOLOW, M.D.



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## THE HYGIENE OF SUBURBAN LIFE.

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THE penalties exacted of us, at every step in the progress of the race toward a higher civilization, are so numerous and severe that many philosophers hold that a return to a more primitive condition is desirable. In every community there are numerous pessimists, who continually groan over the evil tendencies of the times. They admit that the condition of man in respect to material comforts is improved, but they maintain that all the advantages derived in this way are more than compensated for in the decline of man himself in physical and mental power. If these crying philosophers and pessimists are met by certain inexorable statistics, which prove that modern man is larger, stronger, and longer-lived than his ancient prototype, they are incredulous, and refer us to those examples of strength and longevity among men of their youth—the most fortunate period in all time—to the early settlers, who, reared in the midst of hardships and dangers, attained unusual strength, and lived beyond the ordinary period of human longevity. They further tell us that luxuriant homes, railways, paved and lighted streets, sewers and drainage, an abundant water supply, carefully prepared and varied food, suitable clothing, are all agencies which tend to the deterioration of man.

We may admit, if men were few in number, and lived by the chase and by easy tilling of the soil, and made their clothing of the skins of wild beasts or of such rough cloth as the most primitive looms could weave; if each community consisted only of the Patriarch and his immediate descendants, separated from similar communities by leagues of territory; if the soil had not been polluted, and disease-producing poisons were unknown, then, indeed, might the fortunate possessors of such Arcadian simplicity despise the comforts and the manifold appliances of modern civilization. To compare such a primitive society with any State within the historic period is simply idle. We must, in order to judge fairly the civilization of the nineteenth century, institute comparisons between our own period and the condition of men as formed into States at any time within the Christian era. It is absolutely certain that in respect to his merely material state modern man is in every way superior to the generations which have preceded him.

## EPIDEMICS OF THE MIDDLE AGES.

Pitiable indeed was the condition of the human race in those ages of the world when the conditions of health were either unknown or disregarded. There is no spectacle so sad and so terrible as the marvel of a great and fatal epidemic. That spectacle is even now rarely absent from the world, owing to the ignorance and cupidity of men, but the severest epidemics of the present century sink into insignificance when compared with the great epidemics of the middle ages. For example, the Great Plague which devastated, in its ghastly round, the civilized world; Cairo lost 10,000 to 15,000 daily, and India was depopulated. The Island of Cyprus lost almost all of its inhabitants.

We obtain a weird conception of the utter desolation by the statement of the historian Hecker, that ships without crews were often seen in the Mediterranean and in the North Sea, driving about, spreading the plague along the shore as they stranded. Excluding China, it was estimated that this one epidemic of plague carried off twenty-three millions of Asiatics. In London alone 100,000 died. The vast numbers of the dead rendered the ordinary modes of interment impracticable. The Pope consecrated the Rhone, that the dead bodies might be disposed of without delay, and just outside the great cities huge pits were dug in which thousands of dead were thrown at a time. At Vienna there were six large pits containing many thousands, and in London it is narrated that one huge burying-ground alone contained 50,000 corpses arranged in layers in huge pits.

The tremendous mortality of the Black Death, by which Europe lost one-half of its population, permanently affected the development of the civilized nations. In succeeding centuries other epidemic infectious diseases appeared on the scene, devastating cities, provinces, armies, and empires, and settling for ages the destinies of whole nations. It would occupy too much time to dwell on these; but I must say something of that loathsome malady, small-pox, because we are even now familiar with epidemics which may be compared with those under which the human race groaned for centuries. Beginning in Egypt and Arabia about the middle of the sixth century, smallpox accompanied the Saracen armies to Italy and Spain, and spread rapidly, causing a most frightful mortality. Conveyed by the Spanish armies into the New World, it proved more destructive than gunpowder—the civilizing agency by which it was supported and spread. It is stated by the Spanish historians that in a short time after it reached Mexico it carried off

three and a half millions, including the Emperor, the brother and successor to the unfortunate Montezuma. In the eighteenth century 30,000 died of smallpox annually in France; in England about one-tenth of all the deaths were due to this disease, and in Berlin about one-twelfth. So common was this disease during the middle ages that it became a proverb, "From smallpox and love few remain free." It has been well said: "In Europe, as in other countries, smallpox long constituted one of the greatest scourges of mankind. Not a decade passed in which the disease did not decimate the inhabitants in one country and another, or over great tracts of country, so that it came to be more dreaded than the Plague."

#### PREVENTIVE OR STATE MEDICINE.

How is it that the human race, although still invaded by epidemics, suffers so much less than in former times? Populations are denser, cities are larger, communication more direct and rapid, and still the world is comparatively free from those great pestilential waves. The explanation is easy, and must be embarrassing to those pessimistic philosophers who find so much to condemn in our modern civilization. We owe our exemption from, or rather the diminution in severity of epidemics, to the growth of our knowledge of disease, and of the means of prevention. State or preventive medicine has risen into National importance. It would have been a great triumph if the bill creating a National Health Department, lately before Congress, had become a law; for this would have placed us in advance of all other Nations, except England, in a due recognition of State or preventive medicine. But our statesmen opposed it because of the bureaucratic dignity aimed at in the bill, and which could not be utilized as spoils. When epidemics are actually invading us, the machinery of a Government bureau would be found very useful. It is a lamentable thing that our Congressmen know so little of the matter as to fail to appreciate the importance of health to a Nation, and of the pecuniary cost of epidemics.

Far different has been the conduct of our English cousins. When that astute politician and wise ruler, Lord Beaconsfield, took office last, he signalized his entrance into power by making proclamation of the important place which health affairs should have in his administration, rightly recognizing the great influence which the national health and vigor has had in making England the very heart and centre of modern civilization. My Lord has been very busy in other weighty matters, and has not, therefore, paid the same

attention he would have devoted to sanitary affairs, but they have not been neglected. England has an immense sanitary machinery—a Medical officer of the Privy Council, a Registrar-General, a Health Board, and an Officer of Health for each sanitary district. It would occupy too much time to enter into further details, except to state that all questions affecting the public health are most minutely inquired into, and with the result to maintain the best annual average of any civilized country. I am confident I do not exaggerate the importance of the subject, when I affirm that preventive or State medicine is the most necessary duty of a politician in this enlightened era. We are most lamentably behind the English, not only as respects governmental supervision and authority over all sanitary questions, but in the general knowledge of the subject possessed by the people.

What are we to do to maintain the highest condition of health, National and individual, under the circumstances of modern life? Of course, it is my purpose to consider a small section of this large subject, and treat only of such questions of hygiene as may affect a suburban population, situated as are the fortunate inhabitants of this beautiful Clifton.

Men must live together in communities to secure the highest attainable results. To do so with safety and success, they must provide against some of the evils which exist in nature, quite irrespective of the agency of man; and they must learn to avoid those dangers due entirely to population—the poisoning of the air, of the soil, of the water, by man's own excretions. Some of the fairest portions of the earth are rendered unsafe for the habitation of man, by reason of a subtle, diffusive poison called malaria, which lurks unseen in the midst of a luxuriant vegetation, and fruits, and flowers. Any place may be rendered unfit for human occupancy by man's neglect to prevent the evils engendered by his own presence.

#### MALARIA.

I will have something to say first on the evils which we owe to nature. This topic might include climate—the isothermal, isotheral, and isochimenal lines; the rain-fall; prevailing winds; soil and sub-soil; the topography of the country, etc.; but I will confine myself to the single topic—Malaria.

If you ask me what is malaria, I should be quite unable to tell you. The medical profession has been much ridiculed, derided even, for being unacquainted with various poisonous substances that cause certain diseases. Although it is not known whether malaria is a

solid, a gas, a minute organism, the effects which it produces in the human body, and the local and climatic circumstances in which it is developed, are perfectly well understood. That we do not know the composition and form of the poison is not so important, in view of the solid information which we now possess about its effects. That it is a minute germ, vegetable in origin, seems highly probable. In the blood of the disease known as relapsing fever, there has been found recently a living germ, a bacteria, which seems to be the cause, for during the paroxysms of fever these immeasurable minute bodies grow in immense numbers, and during the stage of intermission disappear. In that other intermittent or relapsing fever, which is known as malarial fever, the producing germ probably exists, although it has thus far eluded our present means of investigation.

We know that it arises under certain conditions of soil and climate. It is sometimes called *marsh miasm*, because it is produced abundantly in low-lying, marshy lands; but the marsh is not essential to its development, and some marshes are found within tropics entirely exempt from all sources of malarial infection. Nevertheless, marshy ground, lowlands subject to annual overflow, artificial lakes supplied by surface drainage, in those parts of the world having a sufficiently high summer temperature, are especially adapted to cultivate malaria. I need hardly observe before this intelligent audience that this interior valley of the North American Continent is a favorite home of malaria; for here we have the proper summer temperature, the alluvial soil charged with vegetable matter, the low grounds annually overflowed, the marshes with bottoms and banks of sandy alluvium. The City of Cincinnati stands upon a soil admirably adapted to produce malaria, but the older and central parts of the city have been drained, the streets paved, and in this way the agencies to evolve the poison have been removed. In the suburbs of the city, however, art has vied with nature in the effort to produce malaria. Streets and roadways have been constructed to stop the surface drainage, and all kinds of vegetable matter, usually the city refuse, are employed to form the dam. In every direction we see examples. The good people of Mount Auburn, in their charming homes situated on the highest point in Hamilton County, shake with the "chill" or groan over the numerous ills of the masked ague, and wonder at the phenomenon. It was not so formerly. Here have they lived in great comfort and with much satisfaction for many years without having this trouble. They have done everything for health, and now they must be visited by this new disease—the malaria. Some even suspect that the doctors hide a good deal of ignorance under this term; others, that the doctors

have manufactured it, as in former times they were supposed to poison wells. But, good people, aided by your city officials, you have been engaged for many years in storing up the materials for the production of malaria. All along, below the declivity on which the principal houses have been built, are numerous artificial ponds and marshes into which has poured all the drainage from that part of Mt. Auburn. Here the vegetable matter has been decomposing until after some years the poison has acquired sufficient volume and intensity to roll up the hillside and pour its baleful breath into the houses. Have you not also, good citizens, cut off the great trees which at first protected you from invasion? Who does not know that houses situated on eminences, at the head of ravines leading up from malarious valleys, are especially favorably placed to receive the poison? The wise engineers have cut streets and made fills to obstruct the surface drainage. The good citizens have opened quarries, which also help to obstruct, and they have cut down the belt of trees between them and danger, and they have furnished an unknown quantity of foulness to accumulate in the ponds and morasses. Besides malaria, there are agencies at work to furnish an annual crop of such infectious diseases as scarlet fever, diphtheria, puerperal fever, typhoid, erysipelas, etc. Do not the excretions from these patients pass into and percolate through the soil along the hillside? It is well known that disease germs retain their vitality for a long time, and that the "ground water" is especially adapted to nurture some of them, at least, into full activity.

Malaria in Clifton! Bold, indeed, was the individual who first broached the dreadful fact. He was not a property-holder! Can it be possible that on this elevated plateau, with its still variegated surface, where art has successfully striven to exalt the beauties of nature, there should exist the conditions necessary to produce malaria! In the very efforts put forth to increase the variety, which is one of the claims of Clifton, two errors have been committed: artificial lakes have been formed in an alluvial soil by blocking the natural course of the surface drainage, and the soil has been too much shaded by the over-production of trees and shrubbery. Furthermore, Clifton suffers largely from the miasmatic exhalations of Millereek Valley, and the interesting industries which fill the air with fragrance. Fortunately, a belt of woodland yet extends along the hillside to intercept, in part, the exhalations from this quarter. When some vandal destroys these friendly guardians of the hills, woe betide those who live in palaces at the top. It has been shown that even the sunflower may be so placed as to intercept currents of malaria, and render the poison innocuous. Trees should be

planted to intercept the prevailing winds, and always to intercept the currents of air coming from malaria-breeding ponds and marshes; but trees should not be so planted as to cut off the sunlight from any part of the mansion.

There are numerous ponds in Clifton which may be styled malaria-breeding ponds. If not supplied solely by the surface drainage they are made up largely of water from this source, and they rise and fall with the elevation of the ground-water. The sandy alluvium of the banks and bottoms of these ponds contains abundant vegetable matter undergoing decomposition under the summer sun. In these pools fester animal matters which have percolated through the soil; and here may flourish in undisturbed serenity the germs of fevers, of diphtheria, of cholera, etc. Viewed from the æsthetical standpoint, a Clifton lake is an object of beauty. Encircled by a greensward which grows down to the water; grasses and flowers ornamenting the banks; the long, pendent boughs of the willow gracefully dipping in the lake; in the distance the mansion, and above the blue sky, with fleecy clouds mirrored in the placid surface of the water. Viewed from the hygienic standpoint, your artificial lake is a mud-puddle, full of foulness, and fit only to be the habitation of frogs and mosquitos. The best disposition to be made of it is to let the water flow away, and by thorough subsoil drains remove all traces of moisture. Then plant the beautiful sunflower, which will flourish; it will draw up into its own tissues and render harmless all that is noxious in the polluted soil.

But I cannot speak further of the mistakes of nature, heightened by the industry and stupidity of man. I must now pass to the consideration of those hygienic evils, due to the agency of man only. Here again I must confine myself to a few topics of most practical importance.

#### DRAINAGE.

When a suburban resident proposes to build him a house he were wise to avoid made ground, alluvium with a clay subsoil, marsh or wet soil, or the neighborhood of obstructed water-courses, especially ground once occupied by houses with attendant sources of contamination, etc. People wonder why their children have pasty complexions and are pale and bloodless, or suffer in some inexplicable way from fevers, diphtheria, and other septic maladies. The explanation might be afforded by some source of contamination in the soil on which the elegant mansion was built.

On Murray Hill, New York, where stand some of the finest resi-

dences in that city of private palaces, now and then deadly infectious diseases appeared and carried off, without apparent cause, youth, beauty, manhood, and womanhood. Malignant scarlet fever, diphtheria in its most deadly form, fulminant cases of cerebro-spinal meningitis, cholera infantum, and the whole dreadful catalogue of infectious diseases, visited these mansions of the rich as intent on destruction as in the hovels of abject poverty, and no affection, no skill, no lavish use of money availed anything to avert the fearful visitations. Why? Because in constructing these palaces no attention was paid to the position and character of old drains, obstructed water-courses of the surface drainage, to the polluted soil made up of street scrapings, refuse from kitchens, and excrementitious matters of old privy-vaults. When the happy family, made up of healthy parents and rosy-cheeked children, were fairly installed in their new quarters, their blood was gradually charged with the gaseous emanations making their way up from the cellars, with the germs of disease freed from imprisonment in the soil and carried up with the gases; then came the change of the condition, especially of the younger members of the household; then the outbreaks of specific diseases, coming from—Heaven knows where, for is not this house new and perfect in all its appointments? Subsequent examination of the localities whereon were built these infected houses, made by the Board of Health, disclosed the facts I have stated—that these stately mansions stood on decomposing filth.

In constructing a house the drainage should be to convey away from and not through the cellars. To allow kitchen and chamber slops to be thrown out to the ground about the house is sure to pollute the soil; these should be conveyed away in air-tight drains to the general receptacle. The subsoil of the foundations, to insure the proper dryness, should also be properly dry-ditched and put outside the foundation walls; there should be made a properly constructed blind-ditch or covered drain to intercept and carry away from the house the ground water, which plays, as is known, so important a part in the diffusion of disease germs.

Notwithstanding the evils connected with the modern system of house-drainage communicating with the system of public sewers, or terminating in some private receptacle, the old methods were vastly more injurious. In country places nothing is more usual than the location of the well or cisterns in the same yard of small dimensions with the cesspool. Diffusion of gases and liquids and disease germs through the intervening soil takes place with comparative facility. In the newer cities, and very generally in Cincinnati, the same arrangement exists. Within an area of a few feet

are placed the cisterns, containing the water supply, and the vaults, with the ground water between acting as the medium of communication. Vaults of great depth terminating in a substratum of sand are as little injurious as these receptacles can be made. Shallow vaults which require periodical emptying, constitute one of the greatest sources of poisoning. Into these pass the excretions of the sick, containing the specific germs of disease, and under the conditions here present these germs attain the highest activity. Two kinds of poisoning are possible in any community or city provided with these horrible superficial vaults: First, from them may spread the germs of disease, typhoid, diphtheria, etc., by diffusion into the drinking water; second, the gases of putrefaction and decomposition may carry up into the air specific disease germs, or may themselves impair the vitality of those exposed to them.

The earth closet system is an immense advance on the common vault. It is both cheap and effectual, but is troublesome, and not applicable on a large scale. I have no doubt, indeed, that the earth closet is really the best means thus far proposed to get rid of human excretions in the least offensive way, and it should be adopted in all houses, villages, and small towns unprovided with proper sewerage. It is especially adapted to suburban wants. The accumulation of these closets can be utilized without offense in treating the soil, and the excretions of the sick, which may become, under the ordinary system, a dangerous source of infection, can readily be rendered harmless by suitable treatment in the earth closet.

Some friends of mine travelling in Italy were much amused to observe one day at table a German student inspect with microscopic minuteness every article of food, especially such vegetable food as lettuce. He would turn it over and over, and peer into every crevice. They were amused at an application of German science which should have awakened their respect. This minutely-inspecting German had heard of Italian filth, and he did not intend, if he could avoid it, swallowing any of the numerous parasites which find entrance in this way into the human body. The contents of vaults are used by gardeners to enrich the soil. In this way may our poor bodies become involuntary hosts of greedy parasites. Look carefully, then, O scientific student! lest that crisp, fresh lettuce conceals somewhere within its inviting folds the minute eggs of the tape-worm or living trichina!

#### EFFECTS OF SEWER GASES.

It is a fact which no one can deny, although the relation of cause and effect may be disputed—that the mortality in London and other

English towns provided with a sewerage system has diminished from one-third to one-half. Notwithstanding this fact the question of sewers is hotly discussed. Who has not heard of the marvellous sewers of ancient Rome? The old Romans, who conquered nations and built aqueducts and sewers, knew how to preserve the health of a great population. Is it not strange that this knowledge should be lost, and that modern man should be now agonizing over questions decided on sufficient data more than 2000 years ago?

The sewer is the most safe, direct, and efficient means of getting rid of human excretions.

When Albert Victor, son of the Prince of Wales, took sick of typhoid fever in Marlborough House, the nation demanded an inspection of the drains in this abode of royalty. Much to their surprise the sanitary engineers came upon faulty drains without number, and endless foulness. When the repairs were completed the court physicians had to express their views. Sir William Gull could be satisfied only when assured that the drains could be properly flushed, whereupon one of the London medical journals satirically remarked that Sir William Gull could be satisfied only by turning the Thames into Marlborough House. It must be admitted, I think, that Sir William had the best of it. We may all be satisfied with sewers when they are properly flushed with water—which signifies cleanliness, the highest and most efficient kind of disinfection.

Sewers convey away the surface draining, the materials of vegetable and animal decomposition, and the excretions of man and animals. These matters undergo putrefactive decomposition, producing ultimately a gas of great complexity of composition, and having considerable toxic power. By many sewer gas is supposed to be a distinctive and peculiar gas which can be produced in sewers only; but I need not inform this intelligent audience that the results of putrefactive decomposition are the same without as within the sewer.

Now, I wish to impress on you the distinction which is usually overlooked between the effects of sewer gas itself and those effects which are due to other poisons carried up with it. It has been pretty accurately shown that sewer gas does not produce any specific disease—it does not produce typhoid, diphtheria, scarlet fever, smallpox—but it does deteriorate the health of some, not of all persons, who breathe it for a considerable time. It interferes with the oxygenation of the blood. Thus, if you are breathing an atmosphere highly charged with sewer gas, it is obvious the amount of oxygen entering the blood must be less than is required; and then

also some deleterious gases diffuse into the blood. If sewer gas is breathed more or less daily in the small quantity usually inhaled, the health gradually declines; the skin has an earthy look and is dry and tough; the body wastes; the strength declines so that fatigue is experienced on slight exertion; the appetite becomes impaired and the digestion feeble; attacks apparently of cholera morbus occur, and these come on with increasing frequency; severe headache, backache, and muscular pains generally are experienced, and the mind becomes torpid. When large quantities of sewer gas are suddenly inhaled, then occur the symptoms of asphyxia—of suffocation—due to the deprivation of atmospheric air. I need hardly observe that chronic and slow, not acute, poisoning is the form ordinarily produced by sewer gas.

I must furthermore impress on you the important fact that sewer gas itself rarely hurts any one who is compelled to breathe it, unless it is so concentrated as to exclude air. As ordinarily breathed by those workmen who are engaged in cleaning sewers, it appears to produce no deleterious effect. You may be much surprised to hear this statement, but it is susceptible of easy proof. I have myself caused inquiries to be made among those engaged in the business in this city, and I find that they do not suffer from any disease due to their occupation, and that, indeed, they are exceptionally healthy. But the evidence I have to offer is much more conclusive than this. You will admit, those of you who are familiar with them, that French officials are remarkable for their exactness in all matters of inspection and report. The Paris sewerage system is under the control of a special service of the municipality, and everything connected with it is most exhaustively reported on at certain intervals. They make annual reports on the health of those workmen engaged in cleaning the sewers, and for thirty years it has been the invariable statement that they do not suffer from any maladies produced by sewer gas, and that their health is fully up to the average of the population of Paris. If men who are thus exposed for days and hours at a time to sewer gas, in a comparatively concentrated state, do not experience any ill result from it, what can be the effect of the much-diluted gas which finds its way into houses? Under ordinary circumstances of health, and in the absence of a special susceptibility to the action of the gas, I affirm that the effect is trifling. But there are persons who do appear to have a special susceptibility, and who, if exposed for a certain time, do suffer with the condition I have already described. But we hear of typhoid fever, diphtheria, scarlet fever, etc., produced by sewer gas. Nothing can be more fallacious than such state-

ments. If the poison of disease, of typhoid fever, for example, be a gas or a minute organism, it may be carried up by sewer gas—in other words, sewer gas is the carrier of the contagion, but not the contagious principle itself. I wish to be explicit on this point, because I have been understood to affirm that sewer gas has never been the means of communicating specific diseases. You may have observed the noisome vapor which issues from a sewer opening on some frosty morning, when the cold makes visible to the eye what before was only recognized by the nose.

If the solid particles carried up by the gases generated in the sewers are examined by a microscope of sufficient power, they are found to consist in large part of organized bodies, the minutest forms of animal and vegetable life. Into the sewers as into the ordinary vaults are conveyed the germs of disease, and up again out of the sewer or out of the vault, carried by the gases of decomposition, may they return again to plague us. Given a certain area of population, I beg to observe it does not much matter whether the disease-germs are deposited in one or the other receptacle. If the sewer-pipes are tapped before the house is entered, families may escape the small danger I have mentioned, and a wide diffusion of the disease-bearing matters secured, to reach the community at large. It is obvious that the dangers of sewer gas poisoning are really trifling.

Disease germs reach us in more direct modes. Several strictly local epidemics of typhoid have been caused in England and Scotland by milk. Thus the families supplied by a certain milk vendor have been infected, and the neighbors living under precisely the same local conditions, but supplied with milk from other sources, have escaped entirely. In such instances typhoid had existed at the dairy, or the milk had been contaminated by sewage from poisoned drains. The conclusion might be drawn from such facts that milk was a vehicle of contagion, just as any article of clothing used by a patient; but this is erroneous. The milk has contained the specific germ, but no amount of contact will develop disease unless the germ is swallowed. Still more curious is the fact recently brought to us from Germany, that the meat of certain animals—in the cases just reported, veal—caused typhoid fever in persons widely separated, who partook of the same source. The animals killed appear to have had a disease analogous to the typhoid of the human subject. To develop typhoid, and doubtless also epidemic dysentery, the disease germs must usually be conveyed to us in food or water. Other diseases, it is probable, develop from poisons or disease germs conveyed in the air: influenza, hay fever, cholera, etc.;

others arise only from contact with the person, clothing, or articles of furniture used by the sick. The specific diseases caused by sewer gas must indeed be small in number. I shall be asked, of course, do you hold that sewer gas is not injurious to those who breathe it in their house? I hold it is not injurious in the degree of concentration possible in an ordinary house, unless the person exposed has a special susceptibility to its action, or in the extremely rare case in which a disease germ may be carried up with it.

Beside the important service rendered by an efficient system of sewerage in ridding any suburban locality of the sources of malarial infection and of various poisonous excreta, sewers benefit the health of the population by removing dampness from the soil. It was our own American investigator, Bowditch, who first demonstrated by statistics from New England that there exists an immediate relation between the water surface, the annual rain-fall, and the humidity of the air, and pulmonary consumption. The same facts have been since established for England and other countries, and they have further ascertained in England that a lessened death-rate from consumption has followed the drainage works and sewerage systems. I should also remark that the degree of humidity is influenced in suburban localities by the amount of trees and shrubbery, preventing evaporation of the surface moisture.

#### WATER SUPPLY.

I must now hasten to consider the important subject of water supply in suburban localities. Mr. Simon, the great English sanitary authority, and, until recently, one of the chiefs of the Sanitary Administration, has in one of his reports drawn a severe but faithful picture of the sanitary evils of many suburban localities in England, which is even more appropriate as applied to the state of things in this country:—

"There are houses, there are groups of houses, there are whole villages, there are considerable sections of towns, there are entire and not even small towns, where general slovenliness in everything which relates to the removal of refuse matter, slovenliness which in very many cases amounts to utter bestiality of neglect, is the local habit; where within or just outside each house, or in spaces common in many houses, lies for an indefinite time, undergoing fetid decomposition, more or less of the putrefiable refuse which house life produces; excrement of man and brute, and garbage of all sorts, and ponded slop-waters sometimes lying bare on the common surface; sometimes unintentionally stored out of sight and

recollecion in drains or sewers whieh cannot carry them away; sometimes held in reeptaels specially provided to favor accumulation, as privy-pits and other cess-pools for excrement and slop-water, and so-called dust-bins receiving kitchen refuse and other filth. And with this state of things, be it on large or small scale, two chief sorts of danger to life arise—one, that volatile effluvia from the refuse pollute the surrounding air and everything whieh it contains; the other, that the liquid parts of the refuse pass by soakage or leakage into the surrounding soil to mingle there, of course, in whatever water the soil yields, and in certain cases thus to occasion the deadliest pollution of wells and springs. To a really immense extent—to an extent, indeed, which persons unpractised in sanitary inspection could scarcely find themselves able to imagine, dangers of these two sorts are prevailing throughout the length and breadth of this country, not only in their slighter degrees, but in degrees whieh are gross and scandalous, and very often, I repeat, truly bestial."

If this strong language of Mr. Simon is applicable to England, provided with an effieient sanitary administration, how much more true it is of this country! But I wish to speak now merely of the sourees of contamination of the water supply in suburban localities. The usual methods of supply are two: Storing up rain-water in eisterns, or from shallow wells supplied by the surface water. Deep borings are, of course, exceptional. Those whose houses are provided with ample cisterns supplied by rain-water are apt to eongratulate themselves on the purity of the water obtained from the clouds, and its safe storage. They forget, or do not know, that rain-water may be a souree of malarial infection, for the marsh miasm, in its mysterious form, may be deposited on the roof with the morning and evening dew, and be washed down with the first shower. Similarly may the contagium of specific diseases find its way into the drinking water. A more serious danger of eontamination of the eistern-water is by soakage or leakage from the surrounding cess-pools. No cement has been invented which can prevent the diffusion into the eistern of the liquid impurities in the soil about them. Coneeive, if you can, all the horrors of water contamination in a village or town provided only with shallow wells and cisterns. Think how on all sides, at a few feet merely, are the sourees of the water supply encompassed by cess-pools! How numerous are the examples of cholera, typhoid, dysentery, and other epidemic outbreaks, occurring from the loeal contamination of the water supply by the germs of those maladies deposited in these reeptaels.

These facts being admitted, it is obvious that the water supply to a house should be so situated as to avoid absolutely all contamination of sewage matters. If the supply be of rain-water in a malarious district, contamination is probably inevitable, but the ill results of this, and, it may be, of other kinds of contamination, are rendered nugatory by boiling the water used for drinking. At the boiling temperature, as a rule, the infectious materials of disease are destroyed, or are deprived of infective power. In these days, when so much general information exists on the subject, it seems incredible that contamination of drinking-water by lead should occur, but instances are not infrequent. It is a common but most injurious error to suppose that pure water, such as rain-water, has no action on lead, whereas the opposite is true, with a few exceptions, and the populations of cities owe their exemption from lead-poisoning to the fact that the water is so full of impurities, and of a kind to coat the surface of the lead pipe and prevent any chemical action taking place. As rain-water is a pure water, no lead-pipes or connections of any kind should be used. Lead-pipes may be used in the force-pump—the supply-pipes may be of lead, or the distributing-pipes, with the sure result of chronic or slow poisoning. Not long since, suspecting slow poisoning, by lead, of some members of a suburban family, I hinted at the possibility of the water-pipes being at the bottom of the troubles. I was soon informed that special care had been taken to avoid such an accident, but on examination of the supply-pipe to the force-pump, it was found to be of lead, and was much corroded. Doubtless, a blind reliance on an error which is widely diffused, has induced many persons to employ the cheaper metal wherever possible. In this fact may sometimes be found an explanation of a mysterious ailment—the intractable headache, the paralytic symptoms, the neuralgia, the rheumatism, the indigestions, the colic, etc.

Under no circumstances ought the water of superficial wells to be used for drinking. Beside the numberless impurities which are carried into the well from the surrounding soil, such water is most apt to be contaminated by excrementitious matters, and necessarily the infectious principles of disease. In malarial localities the surface-water usually contains more or less of the miasmatic principle, and, indeed, may be highly charged with it. Rain-water is to be preferred in suburban places, but cistern-water, no matter how carefully collected, should never be used unless it has been carefully boiled. But you will tell me boiling drives off the free oxygen and carbonic acid contained in it, to the presence of which is due the liveliness of potable water. Subsequent filtration, or a mere tem-

porary exposure to the air, suffices to restore these gases, which are readily absorbed from the air.

When the water supply of any suburban locality is derived from the public mains, some of the dangers alluded to are obviated, but others are encountered. It is certainly not an assuring task to investigate the various sources of contamination of Ohio River water. At its source a mountain stream of pure water, its character becomes changed with the increase in its size, until, as we see it at Cincinnati, it is but a gigantic sewer which conveys into the Gulf the excrementitious matters of the vast populations now residing on its banks. When we reflect on the horrible filth which a single town contributes to the Ohio River, it seems incredible that millions of people have no other water to drink. With the increase in population the water must become more and more contaminated, and ultimately it will be a serious question for the peoples of the future to solve. You will tell me that the waters of a running stream possess a power of self-regeneration, so to speak, and that the animal and vegetable matter admitted to it is soon destroyed by a process of oxidation. Although it is true that running water does purify itself in the course of a few miles, and that the organic matter is destroyed, yet there is a limit to this process, and the continual addition of such materials must ultimately be too great for the successful exertion of this oxidizing power. The patient population of Cincinnati continue to drink without complaint the sewerage of Fulton. Our Water-works engineers have contrived a device for collecting all the drainage of the hillsides above the pumping works, so that it may, fitly enough, be pumped into our Garden of Eden, for distribution, without distinction of age, sex, or creed, among the whole body of our population. Now and then some curious person inspecting a vessel of water discovers some strange animals —beasts of hideous mien, snakes, and worms. Nauseous enough are these, but harmless, yet in the water clear and pure hides the deadly virus of disease, the minutest atom of which sets up a ferment in the blood. It is the organic matter dissolved in the water, the invisible germs of disease, that may be present in apparently clear water, against which we should be vigilant. As drinking water is so important an agency in securing the diffusion of disease germs, the population of a great city have a right to demand that suitable precautions be taken to secure an adequate supply of water, not free from mud, but purified of the organic matter of disease. As the matter stands now with us, a case of typhoid fever at Fulton may infect a large number of people in the city proper. I do affirm that the excreta of typhoid fever cases at Fulton may be conveyed

directly into our stomachs. Assailed as we are so seriously, we are not defenseless. If we must drink infantile pollywogs and earth-worms, we may at least render them harmless, as we do trichinæ, by cooking them. Boil the drinking water, and make this an infallible rule of the household at all seasons.

#### AIR.

I should also say something of air, and of the fertile subject of ventilation, but especially of the various sources of contamination of air in suburban localities, yet my time will admit the introduction of but few topics.

How much soever air is necessary to the health during the hours of sleep, in the suburbs some precautions are necessary. After sunset, when evening dew begins to fall, and in the early morning, before the sun has evaporated the dew, it is unsafe for those to be abroad who possess a susceptibility of malarial infection. Windows opening to the windward, or toward ponds and marshes and low valleys, should be closed at night. As far as practicable, rooms on the leeward side of the prevailing winds or currents from infecting localities, should be selected for day uses and as sleeping apartments. Avoid the neighborhood of openings into sewers, of water-closets, privy vaults, or house-drains, especially at night, for there exist in highest activity the conditions which favor the receptivity of all infecting materials. Avoid the early morning air until the system has been fortified by food and drink. Air space and the means necessary to secure a proper supply are much less important questions to suburban dwellings than in the city. The vexed question of ventilation is not to be thought of in this brief exposition of suburban hygiene.

#### DISPOSAL OF SEWAGE AND REFUSE.

I have thus far given, I think, satisfactory reasons why every suburban village or town should be provided with a suitable system of drainage; relief from malarial infection and avoidance of contamination of the water supply and of the air are thereby secured.

I cannot, of course, enter into the subject of the mechanical arrangement and structure of such a drainage system, excepting to state that the drains or sewers should be covered; that they should be properly ventilated by the means now used for this purpose, and that they should have a suitable outlet or receptacle. The sewage matters of the river towns are east into the river, quite regardless

of the present comfort of the towns below them, and absolutely indifferent to the future state of the river itself. In England, of course, the rivers are carefully guarded against pollution. Deplorable, indeed, would be the condition of the water-supply of the island, if stringent laws, properly enforced, did not protect an interest of such tremendous importance. Except in Massachusetts, and in a few localities elsewhere, no systematic attempts to preserve the watercourses from contamination have been made in this country, and I believe Cincinnati may dump into the Ohio River anything it pleases her to deposit there. It is a disgrace to the country, a crime against humanity, a plague-spot in our civilization. The city should be required to render her own sewage or excrementitious matters innocuous, and to utilize it or dispose of it within her own borders, without offence to her neighbors.

In the suburbs the sewage should be collected in a suitable receptacle at such a distance from the dwellings and in such a position as respects the prevailing winds as not to affect the health of the population. In England and France sewage has been utilized on a large scale for the fertilization of the soil. It is collected, treated so as to be harmless, and is then pumped into reservoirs and permitted to flow over the land to be fertilized. I presume you are all aware of the remarkable success which has attended these efforts to utilize the waste of cities. Although it has been a difficult and expensive work for cities, in the smaller towns it has been easily accomplished, and in suburban places like Clifton it may be readily done; if not utilized, at least rendered inoffensive.

I assume in these remarks that the houses are of good class, provided with proper closets and house-drains, communicating with the public sewerage system. When the necessary wealth does not exist, and the houses are small and unprovided with suitable arrangements, what plan for the disposal of excrementitious matters is feasible? These are the conditions which are usually present and require attention.

The first point is the disposition to be made of the excretions of patients suffering from infectious disease. In this age ought the sanitary authorities permit the evacuations of typhoid, cholera, scarlet fever, smallpox, diphtheria, etc., to be thrown on the ground or in an ordinary vault, to percolate through the soil and continue a source of infection for an indefinite time?

Systematic disinfection and destruction of such materials should be an affair of police regulation. The dry-earth system, or some equally efficient plan, should be adopted for excrementitious matters. Garbage and kitchen refuse should be collected in pits, and

its destruction insured by earth-treatment, and the merely liquid matters permitted to drain off through the subsoil when it is sufficiently porous to allow it. The system which is pursued in Cincinnati, a typical example of which is afforded by the filling of Deer Creek, should be employed only in the erection of dwellings for the residences of ward politicians. These ingenious men, however, usually live in fine houses in the city or on the hills, the drainage being good on all sides.

#### PERSONAL HYGIENE.

Morning and evening the fortunate denizens of our suburbs—for they are of the more prosperous class—may be seen hurrying to and from business—the more rapidly from it, I believe. By rail punctual to the minute they fly, or seated behind the trotter or the spanking team, they roll swiftly along the highway. Later in the day, the dew gone, the mist dissipated, the world fully awakes. Madam, in her carriage, resplendent herself and every appointment perfect, appears, intent on business of a great kind or pleasure. In winter your suburban resident has but little to say of suburban life, except to tell his envious comrades how the sun shone on the hills while the gas burns dimly in the office, and how the frosty air is keen and bracing in the country, while murky, close, and full of soot in the town. In the spring and early summer he abandons a position of some reserve, and demands that all his city comrades shall enjoy with him the inviting shade of the trees by day and the cooling breath of night, and leave forever the arid air and the dusty ways of the city.

Is the suburban life a healthy one as enjoyed by our business men? I think I can answer the question in the affirmative. The change from the scene of daily toil both relieves the mind from some of its most depressing cares and prepares it for the work. The change conduces to that repose of the mind which is most favorable to sleep, and the sleep is sounder and more refreshing. The daily change from city to country is a great relief to the tedium and burden of daily business always occupied with the same objects. It follows that the organic functions in general are better performed, and that an increased measure of physical and mental health must be the result.

The arrangements of the daily business in our city are not favorable to the highest enjoyment of suburban life. So early in the morning does business begin in Cincinnati, that a suburban resident must rise with the dawn, and in winter anticipate the sun. This

early and hurried breakfast is unfavorable to health. Again, it is nearly nightfall when, released from his work, he hurries home to dine or sup late. Early to bed becomes a necessity with early to rise, and the enjoyment of the suburban home becomes restricted to Sundays and holidays. The primitive hours of our Western life are well calculated to exhaust the energy of the stoutest physique. Our suburban residents are especially victims of these primitive hours, which have nothing to recommend them except their leveling tendency, for they put the merchant and the professional man, who exercise their intellects chiefly, on the same round of toil as the laborer, who works his muscles only. Business should begin not earlier than nine o'clock, and should close at three, giving ample time for the breakfast, and that leisure for dinner with which only can so important an event be duly undertaken. The hurry of the day permits only the hasty luncheon at noon. The hurry at breakfast, the scramble at lunch, and the fatigue and indifference with which dinner in the evening too often is taken, are injurious to the stomach of your suburban resident. In the evening, fatigued and depressed, when social duties call for action, and Madam prepared by a day's rest or a day's *ennui* for an evening of social enjoyment, your suburban resident is indisposed for the task. He rather experiences a strong inclination for the lower enjoyment of whiskey-punches, cigars, etc., which lessen the sense of fatigue, and remove corroding cares from the mind.

Nothing can be more delightful than a life of elegant ease in a suburban home. The stately mansion with its treasures of art and literature, the grounds with their noble trees, the conservatories, containing the products of every clime, constitute a fitting abode for the refined leisure and cultivated intelligence of the business or professional man, who, having done his work in life nobly, retires appropriately to spend in dignified repose the evening of his days. This is not the lot of all—of many, indeed, in suburban life. The mill continues to grind, and gray hairs, and failing mind, and feeble hands keep on the round of duty and work till the final moment comes.



















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